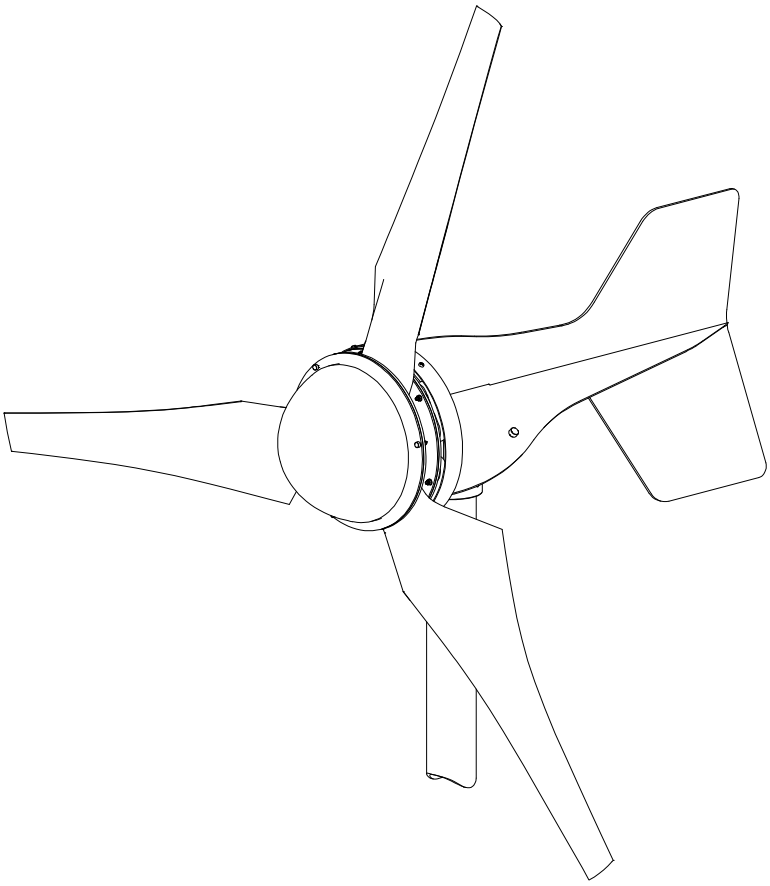
# *LE300 Turbine*

# *Installation & Operation Guide*



***1m Diameter Micro Wind Turbine for generating clean and renewable electricity anywhere the wind blows…***

***Leading Edge Turbines Ltd***

## Contents

### *Disclaimer*

- All specifications are subject to change without prior notice.
- The information given in this user manual is believed to be accurate and reliable. *Leading Edge Turbines* assumes no responsibility for omissions or inaccuracies.
- The user of this information and product assumes full responsibility and risk.
- The LE300 Turbine is a source of electrical power. It must be installed in accordance with local building and electrical regulations. Consult your local planning (zoning) office for details.
- The LE300 Turbine has moving parts that may cause injury due to poor installation and unsafe operation. *Leading Edge Turbines* assumes no responsibility for problems caused by unsafe or unsatisfactory installation or operation.

Designed & Manufactured in the UK By:
Leading Edge Turbines Ltd
Skyrrid Farm,
Pontrilas,
Hereford.
HR2 0BW
Tel: +44 (0)845 652 0396
www.leturbines.com

CE

Compliant with
EN BS 61400-2: Safety of Small Wind Turbines

## *Introduction*

Please read this manual thoroughly before attempting to assemble, install or operate your *LE300* small wind turbine. This will assure optimum performance and safety.

*Leading Edge Turbines* has spent many years developing the ideas and technology behind your turbine. The *LE300* turbine features an array of innovations and construction techniques as well as heavy-duty engineering.

The *LE300* has been designed to be simple, economic, durable and yield excellent performance.

Your *LE300* turbine features:

- Innovative design axial flux alternator using neodymium iron boron magnets
- Laser-cut aluminium chassis
- Maintenance-free, low friction bearing arrangements
- Extremely quiet injection moulded blades with a new airfoil design
- Long-life yaw pivot slip-rings and wipers
- Easy tower-top installation
- Simple design for low cost and durability.

*LE300* is most at home in land-based environments (the *LE300 Extreme* is available for heavy duty and marine applications). Thanks to its unique design, the *LE300* is not susceptible to corrosion in normal operating conditions.

Applications include:

- Remote Homes / Caravans
- Wind-electric water pumping
- Street lighting and road signage
- Complementary installation with photovoltaic modules for home power
- Farm utilities (electric fencing, irrigation, etc)
- Cathodic protection
- Monitoring sites
- Telecommunications
- The Developing World.

## *Safety Precautions*

Safety must always be your primary concern during the assembly, installation and operation of your *LE300* turbine. Always be aware of the risks involved with mechanical and electrical installation work. If in doubt about any issue regarding your turbine, please seek further assistance before proceeding.

**Mechanical Safety Hazards**

- The main rotor is the most obvious and serious mechanical safety risk. When the turbine is operating at its rated performance, the blades will be very difficult to see due to the speed of rotation. Never approach the turbine whilst it is operating. Always shut down the turbine by activating the stop switch. **Ensure that the turbine is installed in a suitable position where nobody can approach or interfere with the path of the rotor blades.**
- Working with tools of any kind can be dangerous. Your *LE300* turbine requires some basic mechanical assembly with rudimentary hand tools. If you are in any doubt about how to use these tools correctly, please seek advice from a suitably experienced person.
- Your *LE300* turbine will inevitably be installed upon a guyed tower or building mount. This may mean working at height. Always ensure that all personnel in the immediate vicinity are aware of any lifting / hoisting operations that will be occurring. Check there are no loose components or tools likely to fall and cause injury during the lifting operation. Where possible, all assembly work should be completed at ground level. In the case of roof mount brackets, a suitable fitter should carry out the installation with the appropriate equipment for working at height.
- Ensure that the batteries are disconnected during the installation procedure.
- Twist the turbine output cables together (to create a short circuit) during the mechanical installation process. This will prevent the turbine from 'spinning up' during the installation.
- Never install the turbine upside down or in any orientation other than that depicted on the installation instructions.
- Install your turbine during a calm day.
- When performing routine inspection or maintenance, always stop the turbine by activating a stop switch.

**Electrical Safety Hazards**

- The *LE300* generates rectified DC voltage. Even at these low voltages there are inherent risks. Caution should always be used when connecting *LE300* to the electrical system.
- Ensure that you have followed the cable-sizing chart (page 12) to ensure that the correct size of transmission cable has been selected. If a cable of insufficient cross-sectional area is used, heat will build up in the cables causing a potential fire hazard. A properly sized fuse or circuit breaker should be used in the cables connected to the battery. This will stop the risk of short circuit currents.
- Batteries used in renewable energy systems can deliver a serious amount of current. A short circuit in the battery circuit can lead to hundreds of amps flowing through the battery cables. This will cause a heat build up and ultimately an electrical fire. Batteries are also susceptible to explode when shorted. Always use insulated electrical tools when working on the battery's electrical connections.
- Batteries are very heavy. Do not attempt to move batteries by yourself. Always use manual handling tools and an assistant.
- Always keep lead-acid batteries the correct way up. Do not allow the acidic electrolyte to spill or come into contact with your skin or face. Always follow the manufacturer's safety instructions when handling lead-acid batteries.

***Please use common sense when installing and operating your turbine!***

## *Specifications*

Turbine Name: *LE300 Turbine*
Part Number: GA-LE300-003
Nominal Voltage: 12 / 24V DC or Grid-Tie optimised

Rotor Diameter: 1000mm
Rated Wind Velocity: 8m/s
Rated Output: 85 Watts
Max Output: 300 Watts
Rated RPM: 800
Start-up Wind Velocity: 2m/s
Total weight: 5.5Kg
Tower mount: 48.3mm Outer Diameter Tube
Chassis Construction: Aluminium
Rotor Blades (3-off): Glass Reinforced Nylon

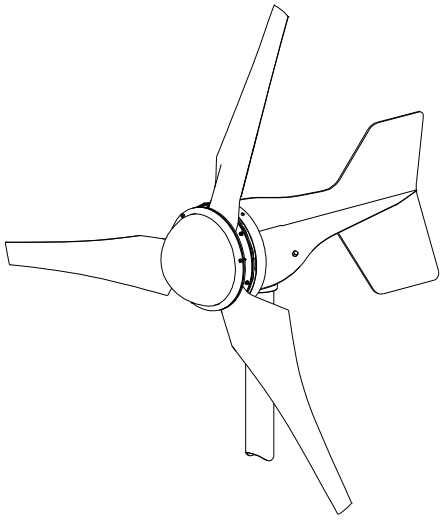


Fig-1: Diametric View

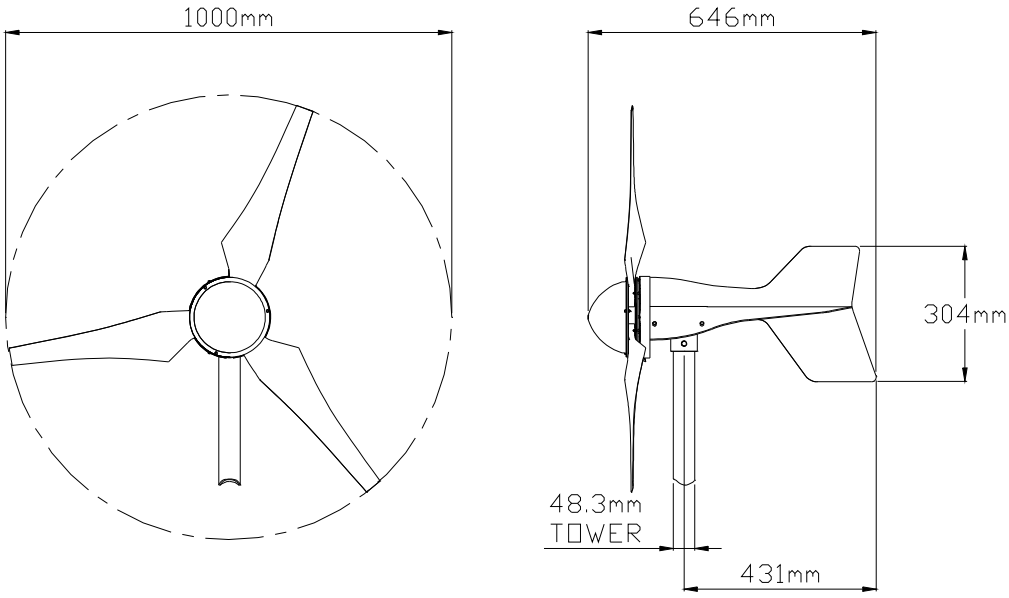



Fig-2: Operating Envelope

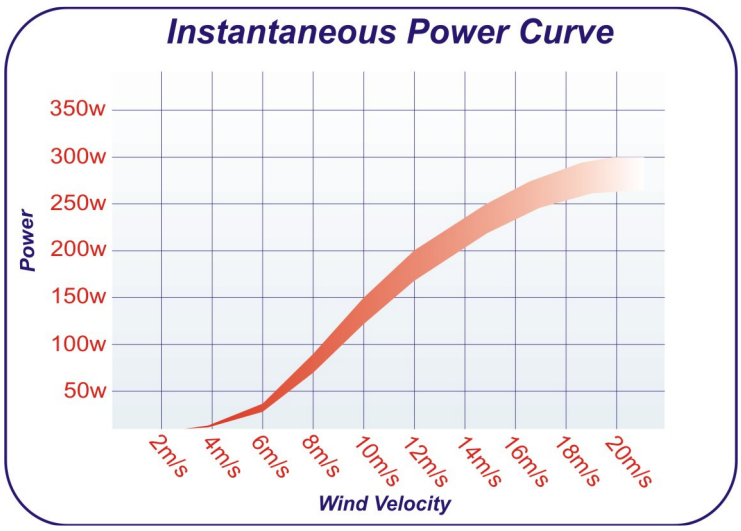
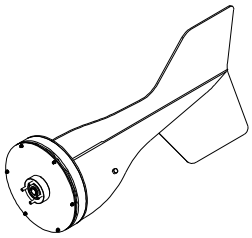



Fig-3: Energy Conversion

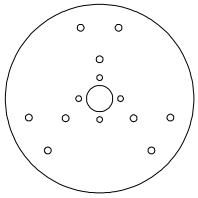
Package Contents

Your *LE300* Turbine will arrive containing the components shown below. If any of the components are missing or damaged, please contact your dealer immediately.

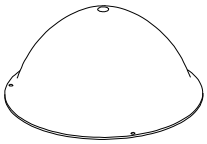


Wren Chassis: Qty 1

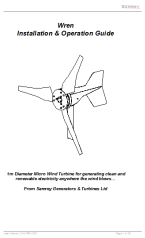
Rotor Blade: Qty 3



Hub Plate: Qty 1



Nose Cone: Qty 1




User Manual: Qty 1

## *Tools Required For Assembly*

You will require the following tools to assemble your *LE300* Turbine:

- 10mm A/F spanner & 10mm ratchet (one of each required)
- 8mm A/F spanner or ratchet
- A Set of Metric Standard Hexagon Keys
- Electrical screw drivers
- Power drill
- 6.5mm diameter twist drill bit, suitable for drilling through steel
- Digital multi-meter capable of measuring DC Volts
- Tape measure or steel rule

## *Mechanical Assembly Procedure*

1) ***Unpacking-*** Inspect the contents of the box and ensure that all items are present and free from damage. If any of the components are missing or damaged, please contact your dealer immediately.
2) ***Check Magnet Rotor & Continuity-*** Ensure that the magnet rotor is free turning and does scrape or rub on the coil disc as it rotates - see fig 4. You may feel a slight resistance from the bearings at this stage. The bearing units used in the magnet rotor assembly are factory lubricated and sealed for life. It will take approximately 100 hours of normal operation for the bearing seals to 'bed-in' and the lubrication to be distributed correctly around the bearing raceways and ball cages. During this period you may notice a reduced performance caused by the additional friction of the bearing seals. In operating temperatures of –10 degrees Centigrade or lower, this 'bedding-in' period will be extended by a further 50 hours of normal operation. Connect a digital multi-meter to the positive (red) and negative (black) output leads extending from the yaw pivot. With the multi-meter set to detect DC Volts (0-20V), a voltage should be displayed when the magnet rotor is spun. This voltage will vary with the speed of rotation. If the magnet rotor rubs, or no voltage is detected whilst turning the magnet rotor, please contact your dealer immediately.

**Warning: The magnet rotor on your *LE300* turbine is constructed using neodymium iron boron rare earth magnets. These are extremely powerful magnets and can cause injury if not handled with respect. Take care when working with tools made of ferrous materials (such as spanners and screwdrivers) close to the magnetic poles. The magnetic forces between ferrous materials and the magnet rotor will be very strong. This may cause a sudden snapping action that can pinch or trap your fingers or skin.**

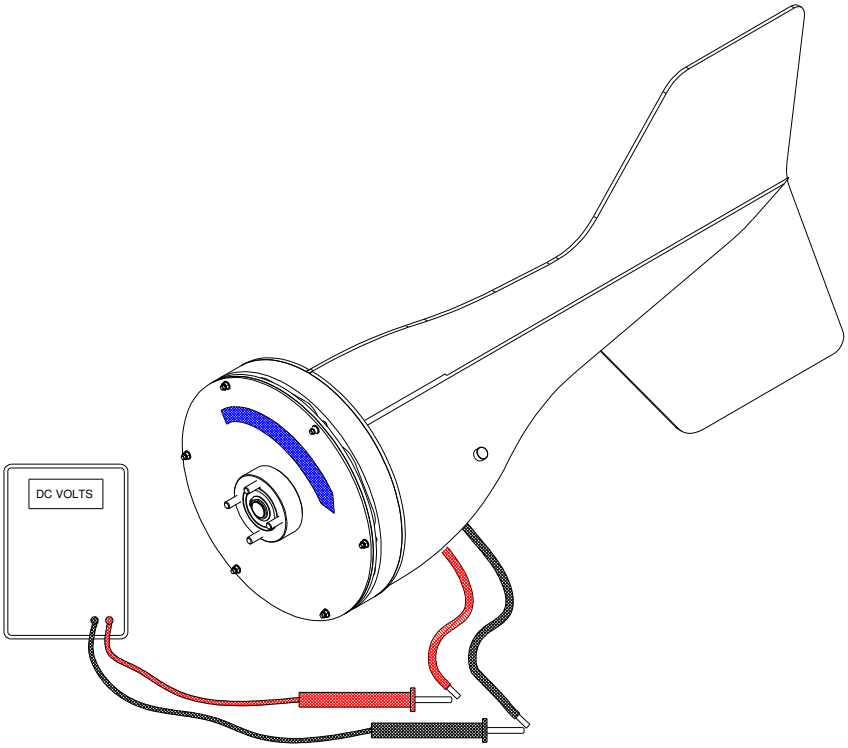



Fig-4: Checking Magnet Rotor rotation and Coil-disc continuity

3) ***Rotor Blade Assembly-*** Take the three rotor blades and rotor hub plate. Be careful when handling the blades, they may have sharp edges. Use a 10mm A/F socket & hexagon key and three M6 x 16mm long cap-screws to attach each blade to the hub plate - see fig 5. The blades should all be fixed to the hub plate on the same side, with the blades in the same orientation. It is important that a washer is used underneath the anti-vibration nuts. 3 set-screws, 3 washers and 3 anti-vibration nuts should be used on each blade. Tighten the fixings until the blades are safely secured. Do not over-tighten the nuts as this may damage the blades and fixings.

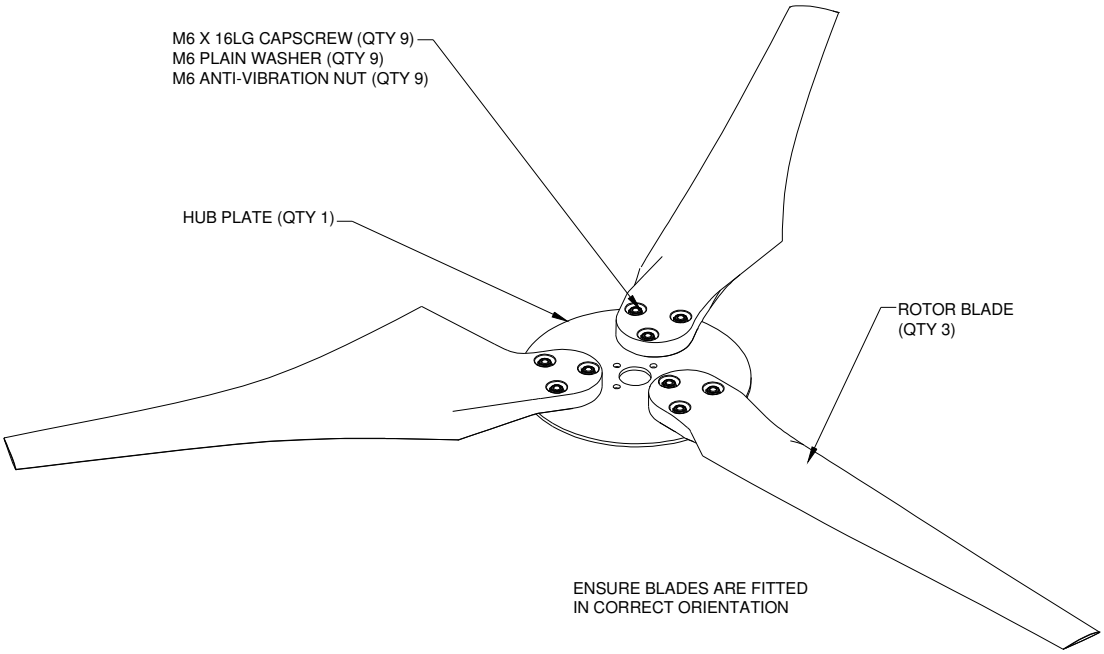



Fig-5: Attaching the 3 rotor blades to the hub plate

4) ***Check the Tip Spacing-*** Lay the assembled rotor blade on a flat surface. Using a tape measure or long steel rule, ensure that the spacing between each tip is equal to within a tolerance of +/-1.5mm. Adjust the blades as required. Output performance may suffer if the blades are inaccurately set - see fig 6.

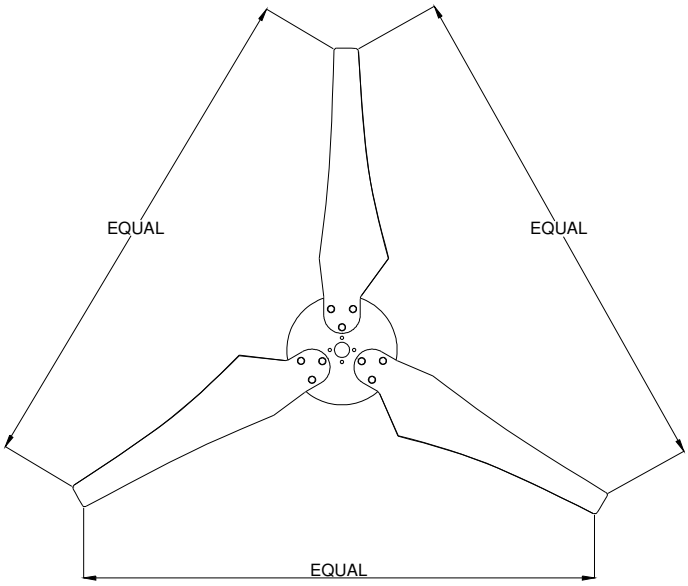



Fig-6: Checking tip spacing

5) ***Fit the Rotor Blade Assembly-*** The assembled and balanced rotor blades can now be fitted to the LE300 chassis. This is done by offering the rotor hub plate against the studs protruding from the magnet rotor on the chassis. ***Ensure that the assembled rotor blade assembly is offered to the studs in the correct angular orientation***. If the rotor blades clash with the nuts on the back of the magnet rotor, remove the rotor blade assembly, rotate by 90 degrees and refit to the drive studs. M5 washers and anti-vibration nuts should then be used to fix the rotor hub in position. Ensure that all 4 nuts are securely tightened and that the rotor blades are fitted with the flat side of the blade facing

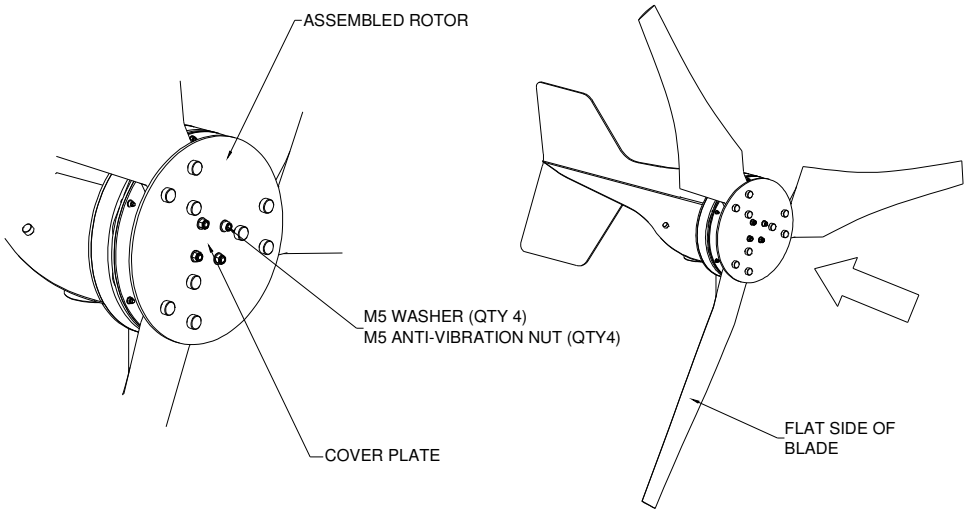



Fig-7: Fitting the rotor blades to the Chassis

6) ***Check the blade rotation-*** Once the blades have been fitted and secured to the chassis, ensure that they rotate freely. Also take this opportunity to check that all of the blade and hub fixings are secure - see fig 8.

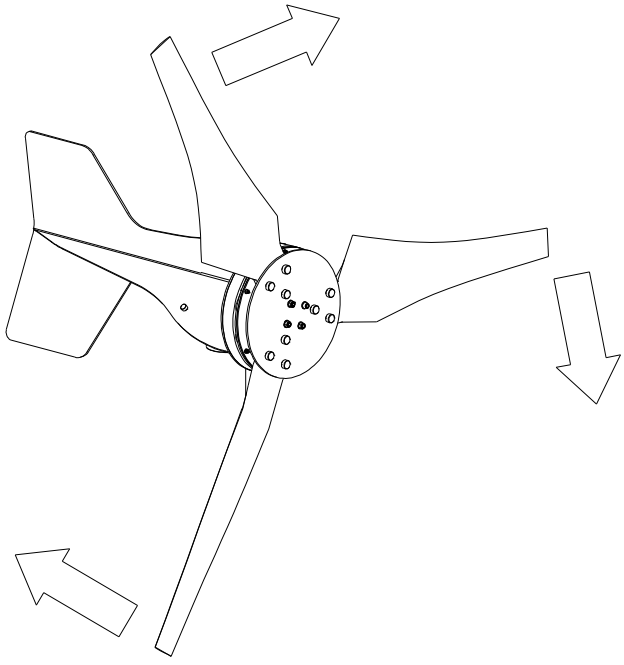


Fig-8: Check Blade Rotation

7) ***Fit the nose cone-*** The nose cone can now be fitted to the rotor. This is done by aligning the 3 mounting holes of the nose cone with those on the rotor hub plate. Use 3 M5 x 12lg screws to secure the nose cone in position. Ensure that the nose cone run concentrically by spinning the rotor by hand. Slackening the fixings and adjusting the nose cone position accordingly should correct any misalignment or 'wobble' - see fig 9.

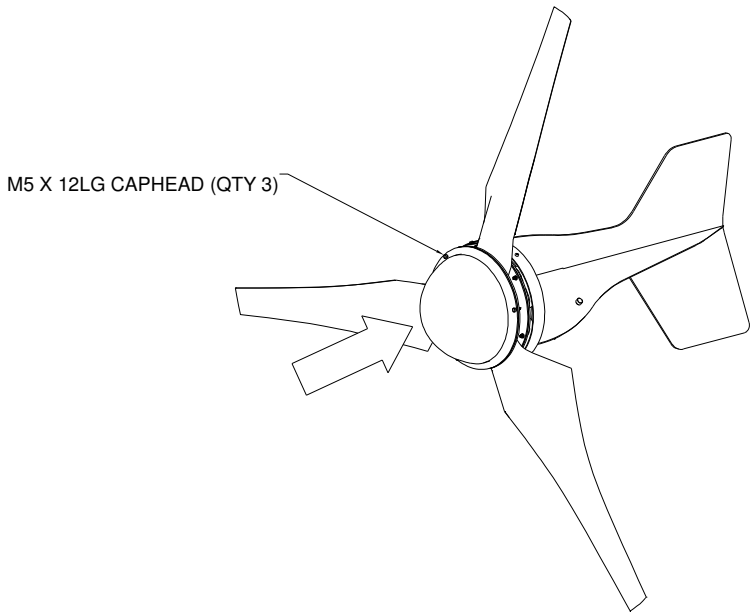



Fig 9: Attach the nose cone

8) ***Prepare the Turbine Mount-*** If you have purchased a *LE300* wall mount bracket or self-supporting tower from a *Leading Edge Turbines* dealer, then please refer to the separate installation instructions supplied with the product. No further work is required to install *LE300* onto any of these products once they have been installed as per the instructions. However, if you have sourced your tower / mount bracket from an alternative supplier, it is likely that a 6.5 diameter hole will need to be drilled in order to secure the turbine. This hole should be drilled 18mm from the top of the tower / mount bracket and should be perpendicular to the surface. The hole should penetrate both sides and cross the centre line of the tubular section - see fig 10.

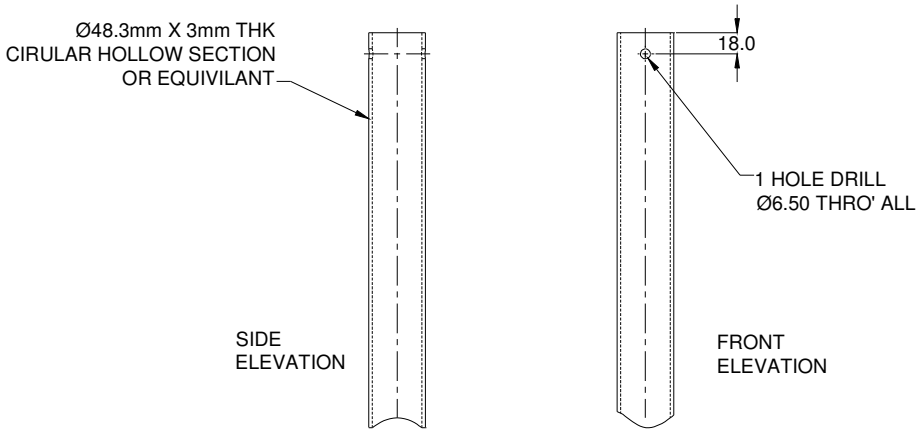



Fig-10: Drill through top of tower / mount bracket

9) ***Install the Transmission Cables-*** When your tower or mount bracket is ready to receive its turbine, the next stage is to run the cables from the top of the tower to where the electrical controller and batteries / grid-tie inverter will be located. Follow the table below to select the correct wire size (cross-sectional area). This will vary depending on your nominal battery voltage and the distance that the cables will be run. Careful selection of the cable size is required. It will not only affect the safety of the system, but also the overall efficiency. A cable of insufficient cable size will cause a voltage drop, wasting the power that has been generated. The cable sizes listed below have been selected with efficiency and cost in mind, as it is unlikely that your turbine will be running at full capacity 100% of the time. If in doubt, consult your local electrical supplier. The cable should be installed in accordance with local electrical regulations and guidelines. If in doubt, use a local electrical contractor to complete the cable installation.

**Warning: If a cable of insufficient cross-sectional area is used, heat will build up in the cables causing a potential fire hazard. Cable capacities quoted below are based upon 'Tri-Rated' cables (BS6231).**

| | **Transmission Distance** | | |
|---|---|---|---|
| ***LE300* Nominal Output Voltage** | 10 Metres (30 Feet) | 30 Metres (90 Feet) | 100 Metres (300 Feet) |
| **12 Volts** | 10mm² | 25mm² | Not Recommended |
| **24 Volts & Grid-Tie** | 2.5mm² | 10mm² | 25mm² |

10) ***Mount the LE300 Turbine onto the Support Structure-*** Ensure that the previously installed power transmission cables are not yet connected to any batteries and are 'shorted' together. This will prevent the turbine from operating during the installation process. Once this has been done, connect the turbine output cables to the transmission cables using a terminal block with a minimum rating of 30 Amps. Offer the turbine up to the support structure and push the turbine body onto the tower. Ensure that no cables are snagged. Use the M6 x 65 set-screw along with two washers and an anti-vibration nut to secure the turbine using the hole previously drilled and the hole in the yaw pivot - see fig 11. Ensure that M6 set-screw is securely fastened.

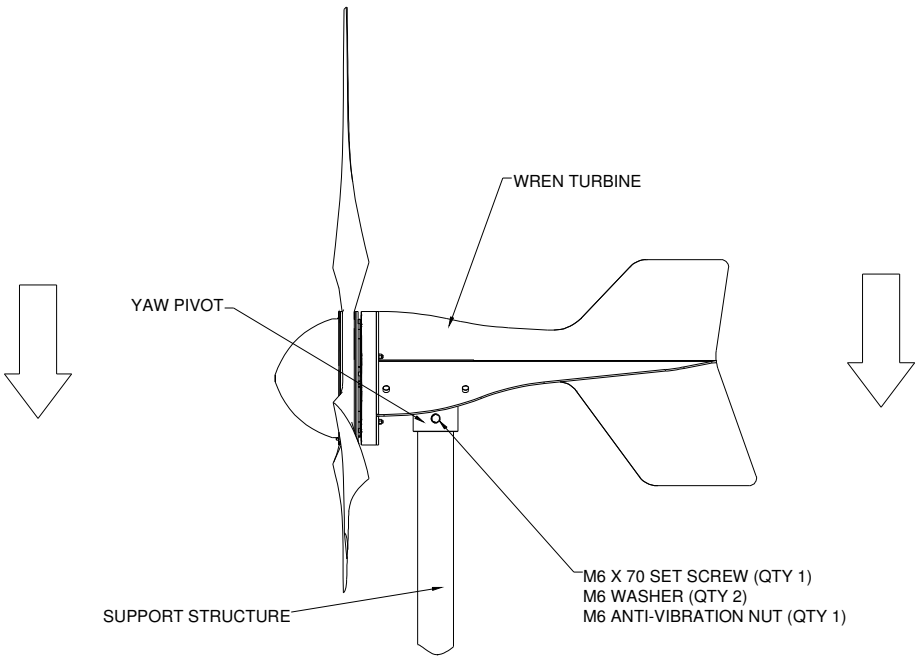



Fig-11: Fitting the turbine onto the support structure

## *Electrical Installation*

Please refer to fig 12 - 14 for appropriate generic wiring diagrams. In a battery charging renewable energy system, there may be different ways of wiring small wind turbines, photovoltaic panels, charge controllers and batteries together. This type of system will often expand 'organically', but the following guidelines should be followed:

- ***Follow the appropriate electrical code -*** The electrical wiring of your LE300 turbine and associated electrical systems must be done in accordance with national and local electrical codes and regulations.

- ***Do not connect the turbine or batteries during the installation -*** Ensure that the turbine is not running or connected to the batteries during the installation or wiring process. Connect the output cables of the turbine together to prevent the rotor from starting up.

- ***Galvanic corrosion of electrical joints -*** Try to avoid connections between dissimilar metals. For example, connecting copper and aluminium together will result in galvanic corrosion of the connection. This will increase the electrical resistance of the connection (wasting energy), and reduce the mechanical integrity of the joint. Where possible, use a fluxed solder to make electrical joints.

- ***Protect the cables -*** The power transmission cables must be protected from mechanical damage and fatigue. Run the cables through an approved conduit / trunking.

- ***Cable strain relief -*** Prevent mechanical strain on the transmission cables running down the tower from the turbine. Clip the cables to the inside of the tower. Failure to do this will result in excessive mechanical strain on the cable joints within the slip-ring assembly and may cause a failure. Cable ties or cable glands are a good way to prevent mechanical strain on the cables.

- ***'Negative Earth' System -*** The *LE300* turbine is based upon a 'negative earth' system. This means that the negative output cable and the turbine chassis is 'grounded' at 0 volts. The negative terminal of the battery bank should also be earthed. This provides protection against the build up of static and lightning strikes. The tower should be earthed separately with its own ground rod if there is a long transmission distance between the tower and batteries. An appropriate surge arrestor should also be used to help prevent damage to the battery charging system during a lightening strike. Ensure that the earth cables are of the same rating as the positive and negative cables.

- ***Cable Selection -*** The cable size table shown on page 12 should be used to select the minimum sized cable for a given transmission distance. Voltage drop in the cable will be improved if a larger cable is used. We recommend using 'Tri-Rated' cable as it should comply with the wiring codes for your area.

- ***Fuses -*** The turbine and charging circuit should be protected with a suitably rated 'slow-blow' DC fuse or DC circuit breaker. Please refer to the table below for the correct rating. The fuse or breaker should be positioned between the turbine and batteries (on the positive cable). If a stop switch is used (recommended) the fuse should be positioned between the switch and the batteries.

| ***LE300 Nominal Output Voltage*** | ***DC Fuse / DC Circuit Breaker Rating*** |
|---|---|
| ***12V*** | 25 Amp |
| ***24V & Grid-Tie*** | 13 Amp |

- ***Run / Stop Switch -*** A simple switch arrangement can provide a safe and easy way of stopping the turbine during high winds or for maintenance. A 'SPDT' (single pole double throw) switch is best for this purpose. As the switch is thrown, the batteries are disconnected and the turbine is 'shorted' reducing the rotor to a slow rotation. Refer to the generic wiring diagrams.

- ***Charge Controllers -*** A diversion charge controller is recommended to manage the power output from the turbine to the batteries. A diversion charge controller operates by increasingly switching output to a dump load once the batteries begin to reach high voltages. The dump load consumes the 'excess' power from the turbine. This means that the turbine's power output is always utilised whether the batteries are fully charged or not. Depending on the size of the dump load, the turbine may slow down or stall during a period when the power is being diverted. Larger capacity battery banks will be able to store more energy and so the dump load will be used less. The use of photovoltaic type (shunt) charge controllers may be used but are less preferable than the diversion type. The model of shunt charge controller Leading Edge Turbines recommends 'short-out' the power source once the battery voltage increases. Once the batteries are fully charged, the controller commences 'shorting-out' the turbine intermittently to regulate the battery voltage. This may lead to damage of the blade roots due to the turbine constantly being shorted out during high winds, and generally less efficient battery charging.

- ***'Hybrid' Systems -*** The *LE300* turbine can be used in parallel with PV panels. We recommend that the PV panels are wired independently with a separate charge controller specifically designed for use with PV panels, and connected in parallel with the battery bank - see Fig-13.

- ***Use of Grid-Tie Inverters -*** It is possible to connect your *LE300* to a grid-tie (grid connect) inverter. It is recommended that only grid-tie inverters supplied by *Leading Edge Turbines* are used to ensure that an appropriate MPPT curve has been programmed.

**Please refer to the following wiring diagrams as a guide.**

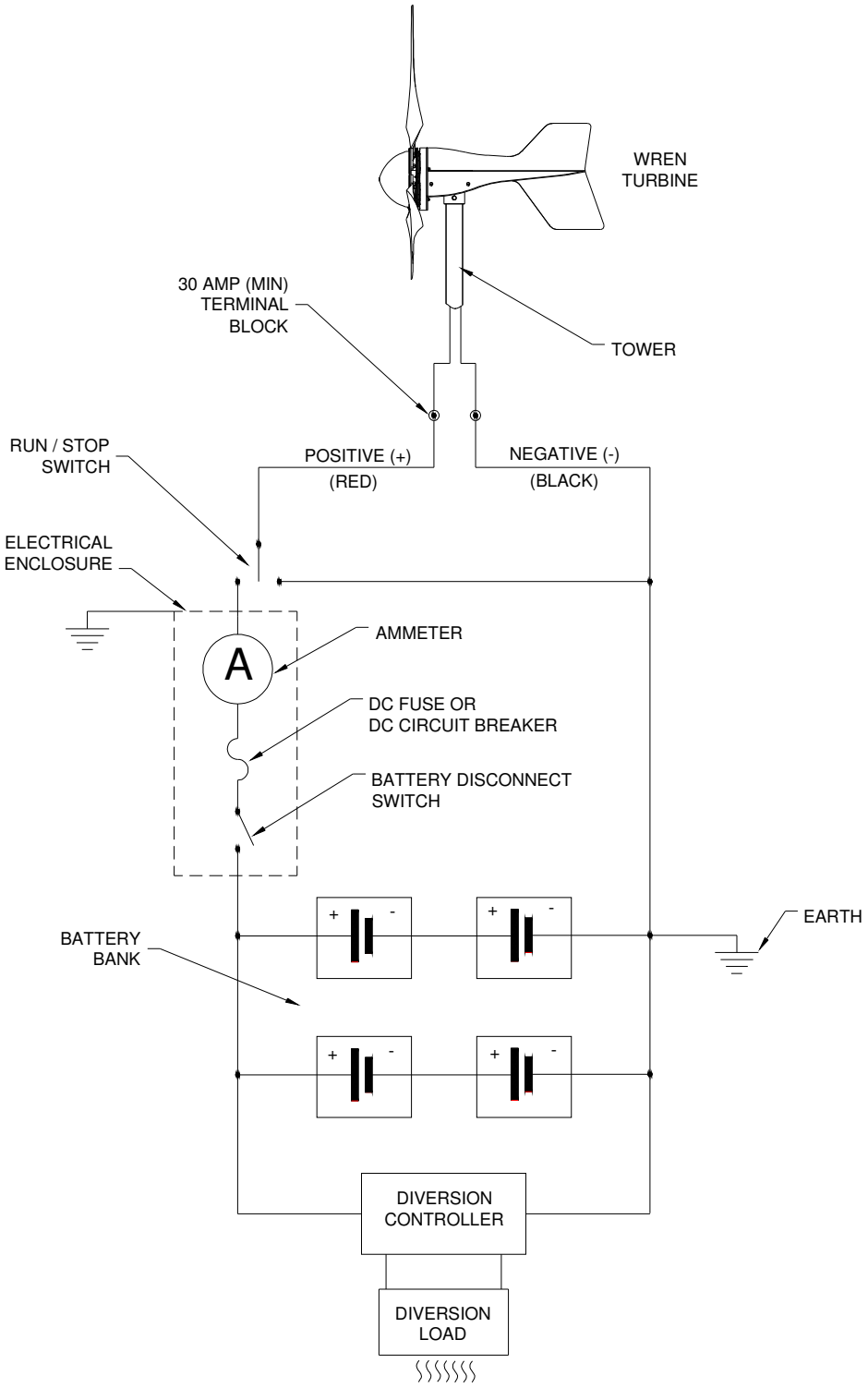



Fig-12: Typical 'Stand-Alone' Battery
Charging Wiring Diagram

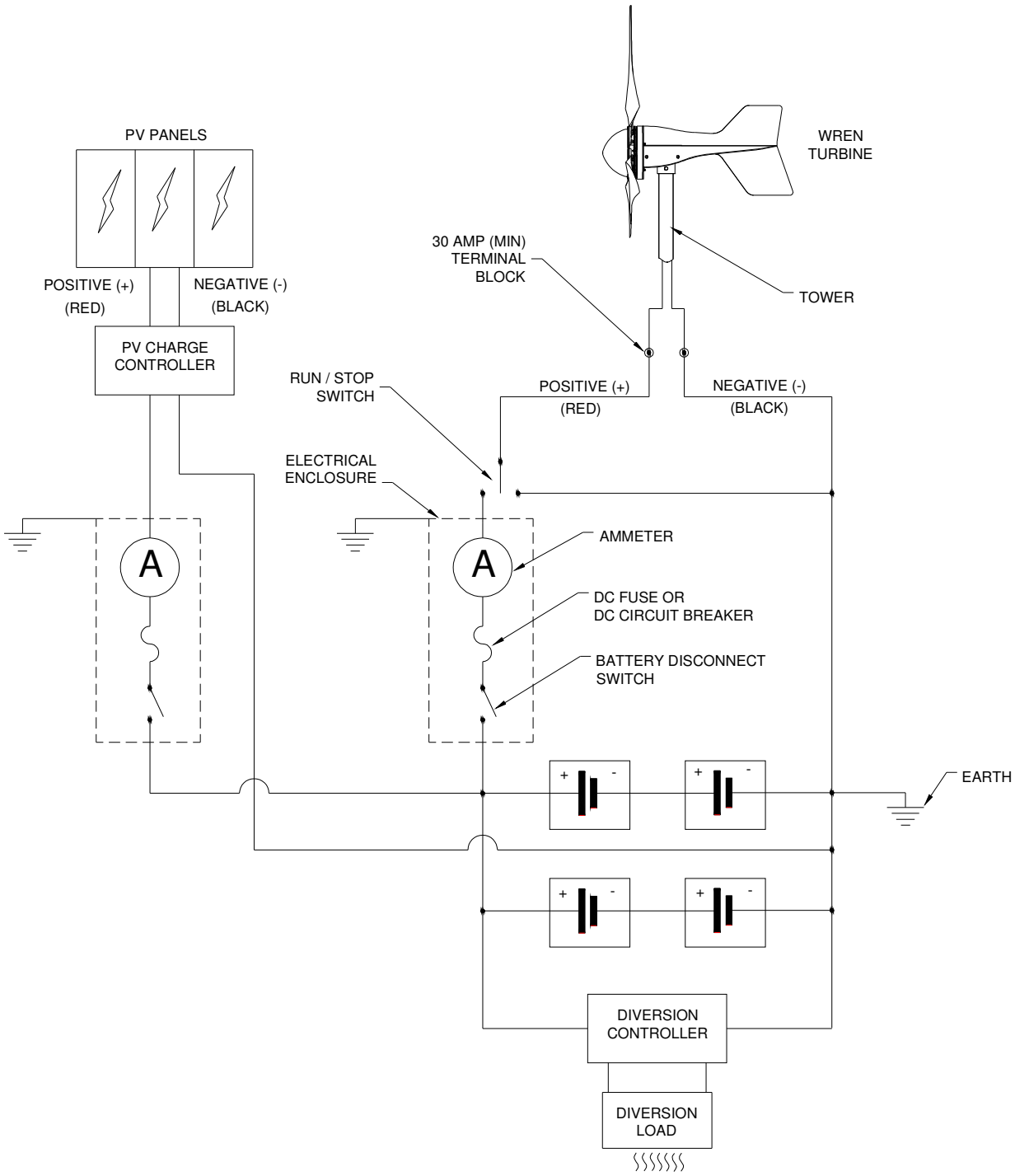



Fig-13: Typical 'Hybrid' Wind /PV System Wiring Diagram

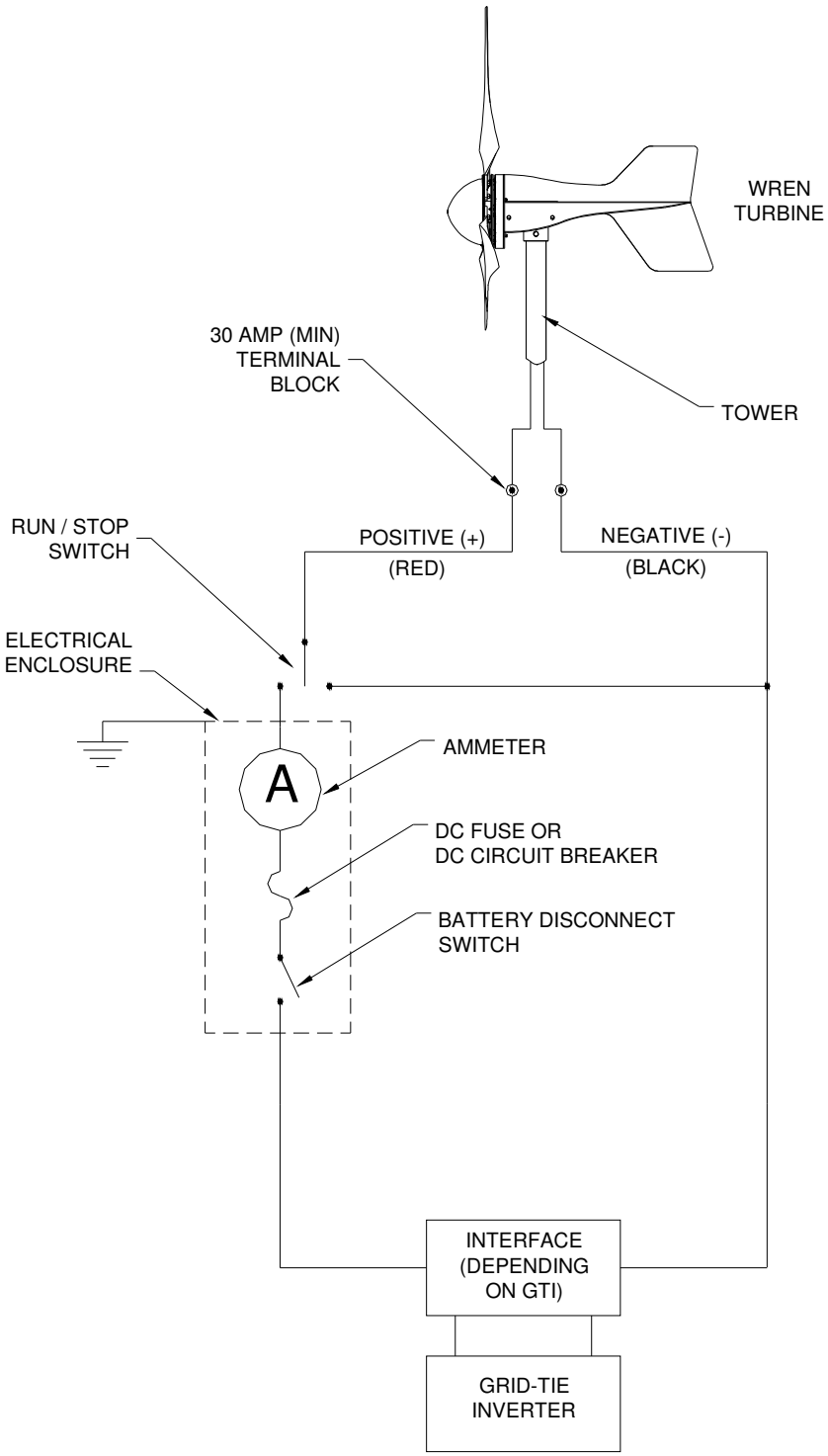



Fig-14: Typical 'Grid-Tie' System Wiring Diagram

## *Turbine Operation*

The LE300 turbine is based on a simple design for ease of installation and reliable operation. You may notice the following behaviour during normal operation:

- ***Cut-in -*** The turbine will not begin to charge the batteries until the rotor is spinning at approximately 350 RPM. Whilst operating below this speed, the turbine will be 'off-load' and will be freewheeling. Once the turbine output voltage becomes equal to the nominal battery voltage (at around 350 RPM), the turbine will come 'on-load' and begin to deliver current to the batteries. During the off-load stages of rotation, the rotor blades rotate very freely. This allows the rotor to build up speed and allows aerodynamic lift to be generated by the blades.

- ***Normal Operation -*** Once the rotor is spinning at 350 RPM, current will be delivered to the batteries. As the rotor speed increases, so too, will the current and voltage. Excessive wind speed may increase the battery voltage to a high level. Once this happens, the diversion charge controller will recognise that the battery voltage is too high, and switch the turbine output to the dump load.

- ***Charge Regulation -*** Once the charge controller has switched over to the dump load, the turbine will no longer be charging the batteries. Instead, the power from the turbine will be delivered to the dump load (usually a resistive heater element). Depending on the capacity of the dump load, the turbine may be seen to rotate more slowly. The battery voltage will begin to drop to normal levels during the regulation period. Once the battery voltage is back within acceptable limits, the charge controller will switch the turbine output back to batteries. Refer to the charge controller user manual for specific operational instructions.

- ***Shut Down -*** By activating the stop switch, the output from cables of the turbine are 'shorted' together. This effectively puts an infinite load on the generator causing the turbine to stall. When the stop switch is activated, the turbine may still rotate slowly during high winds, but the rotor blades will not be able to build up any significant speed. It is not recommended that the stop switch be activated whilst the rotor is spinning at high speed. This sudden braking action will stress the blades and other components. Activate the stop switch during a 'lull' when the rotor is not spinning excessively fast.

- ***High Winds -*** Every effort has been taken to ensure that the *LE300* will withstand the forces exerted by strong winds. However, the raw power in high winds is immense, and the stresses placed upon the turbine are magnified by gusty and turbulent conditions. Where possible, the turbine should be shut down in advance of particularly strong winds (60+ MPH) and storm conditions. This will decrease the wear and tear on the machine and will help to avoid a failure. The rotor blades may rotate slowly during the shut down period, but the forces exerted will be greatly reduced during strong winds. Protect the turbine from extreme winds as you would protect other items of your property.

- ***Grid-Tie Applications-*** When connected to a grid-tie inverter, the *LE300* will operate in much the same manor as when it is charging batteries (except for the use of dump loads). It is important that the Grid-Tie inverter characteristics are matched to the power curve of the turbine to ensure optimum performance. An appropriate electrical interface may also be required depending on the inverter equipment being used. It is generally only recommended that *Leading Edge Turbines* approved and programmed inverters be used with the *LE300*. Refer to your *Leading Edge Turbines* dealer for more information on this

***Note: Never allow the turbine to run off-load with no connection to a battery bank or dump load. Doing so will allow open circuit voltages to be generated by the turbine. These voltages may be dangerous and will damage the stator coils within the turbine.***

## *Maintenance*

Please follow the preventive maintenance program listed below. This will ensure that the turbine operates reliably and safely with good efficiency.

**Always shut down the turbine before attempting to carry out maintenance.**

***Post-Installation Checks (to be carried out one month after installation):***

- Check that the tower mount pin is secure and has not worked loose. Adjust if required.
- Ensure that the rotor hub is still securely fitted.
- Ensure that the rotor blades rotate freely.
- Monitor the output. Ensure that the turbine and charge controller are functioning correctly.

***Annual Maintenance:***

- Inspect the tower / support structure.
- Remove the turbine from its installation to a suitable workbench.
- Remove the rotor blade assembly (reverse the process used on page 10 / 11).
- Inspect the edges of the rotor blades for damage such as dents or chips. The blades will become unbalanced if they are damaged. This will cause vibration, noise and poor performance. If many dents have occurred along the edges of the blades, a new set of rotor blades should be fitted (part numbers available in the Spares section).
- Inspect the roots of the blades (attachment tabs) for signs of stress cracking or fatigue. A new set of rotor blades should be fitted if any cracks of fractures have occurred (part numbers available in the Spares section).
- Remove any build-up dirt and debris from the rotor blades using mild detergent in warm water.
- Check the blade hub fixings for tightness.
- Check and rebalance the rotor blades as required (see page 9).
- Carefully remove the yaw mount bracket by unscrewing the 4 connection screws from the sides of the LE300 chassis. Inspect the slip rings and wipers for obvious signs of wear. Replace the wipers if required (part numbers available in the Spares section). Reassemble the yaw pivot carefully (do not to pinch any cables).
- Check that all electrical connections are sound and free from corrosion.
- Generally ensure that the turbine is in good working condition and is safe for continued use.

***After Five years of normal operation:***

- We recommend that the rotor bearing and rotor blades should be replaced after five years of continuous operation. This will ensure that the turbine's performance and safety is not compromised.

***Other Considerations:***

- The equipment used in the charging system (batteries, charge controller, PV panels, invertors, etc) should be maintained according to the instructions published by the relevant manufacturer.
- Where lead acid batteries are used, it is especially important that they are maintained carefully. Failure to do so will result in the batteries being rendered useless within a short period of time.

## *Spares*

The following components may need to be replaced during the service life of your LE300 turbine. Please contact your nearest *Leading Edge Turbines* Dealer, and quote the part numbers listed below.

| | |
|---|---|
| **Rotor Blade (qty 1):** | DP-LE300-073A |
| **Slip Ring Wiper (qty 1):** | DP-LE300-063 |
| **Slip Ring (qty 1):** | DP-LE300-029A |
| **Coil-Disc (24VDC):** | SA-LE300-007 |
| **Coil-Disc (12VDC):** | SA-LE300-010 |
| **Bridge Rectifier:** | OS-019 |
| **Yaw Bearing & Housing:** | OS-016 & DP-LE300-015A |
| **Rotor Bearing & Housing:** | OS-018 & DP-LE300-038 |
| | |
| **Run / Stop Switch Box:** | GA-CTRL-008 |

## *Warranty*

Your *LE300 Turbine* carries a two-year warranty from the original purchase date.

During the warranty period, any component found to be defective in material or workmanship will, at the discretion of *Leading Edge Turbines*, be replaced or repaired at no charge.

This may be done on a 'return-to-base' arrangement for serious defects. For minor component failures, replacements may be sent directly to the customer / dealer for replacement. This can be negotiated at the time of the warranty claim to come to a mutually convenient arrangement for all parties. *Leading Edge Turbines* will take all reasonable action to ensure customer satisfaction. You will always receive a warm, courteous service in or out of your warranty period.

Your turbine must be installed and operated in accordance with this guide and local codes. Failure to do so will result in this warranty becoming null and void. Any unauthorised modifications to the turbine design will void the warranty and may comprise the safety of the machine.

**What is not covered by your Warranty:**

If your turbine is commissioned by *Leading Edge Turbines*, the following are excluded from the Warranty

- Damage caused by the neglect of periodic maintenance in the manner recommended.
- Damage caused by repair or maintenance performed using methods not specified by *Leading Edge Turbines* or by non-authorised dealers of *Leading Edge Turbines* products.
- Damaged caused by the use of non-genuine parts, or from the use of liquid agents or lubricants in or on the turbine, tower or control equipment.
- Damage caused by operating the turbine in conditions outside of those specified in the Owners Guide – including, but not limited to, allowing the turbine to run off-load.
- Damage caused by modifications to the turbine, tower or control equipment not approved by *Leading Edge Turbines*.
- Damage caused to the turbine, tower and control equipment by improper storage or transport.
- Damage caused by lightning strikes
- Damage due to extremely high winds and storm conditions (60mph+)
- Damage caused by flying debris.
- Aesthetic phenomena that do not affect performance.

If your turbine was <u>not</u> commissioned by *Leading Edge Turbines*, the following are additional Warranty exclusions.

- Damage caused by unsatisfactory installation of the turbine, tower and/or control equipment.
- Damage caused by unsatisfactory tower / support structure design
- Damage caused by incorrect connection to external electrical equipment, or failure to observe current regulations concerning connection to external electrical networks, equipment or any other devices.

If you should experience a problem with your turbine, your first 'port-of-call' should be the reseller or installer from whom you purchased the product. They will be able to resolve the problem quickly and efficiently. If you are unable to contact the original reseller, then please contact us directly. Please quote the serial number of your turbine when dealing with Warranty issues. The serial number can be found on the nameplate positioned on the underside of the chassis.